

# Molecular Sciences Research Center

Ana R. Guadalupe, PhD  
Executive Director  
August 13, 2019



152,000 sq. ft.  
Research space

Seven Floors

Laboratory Space

Co-working Space

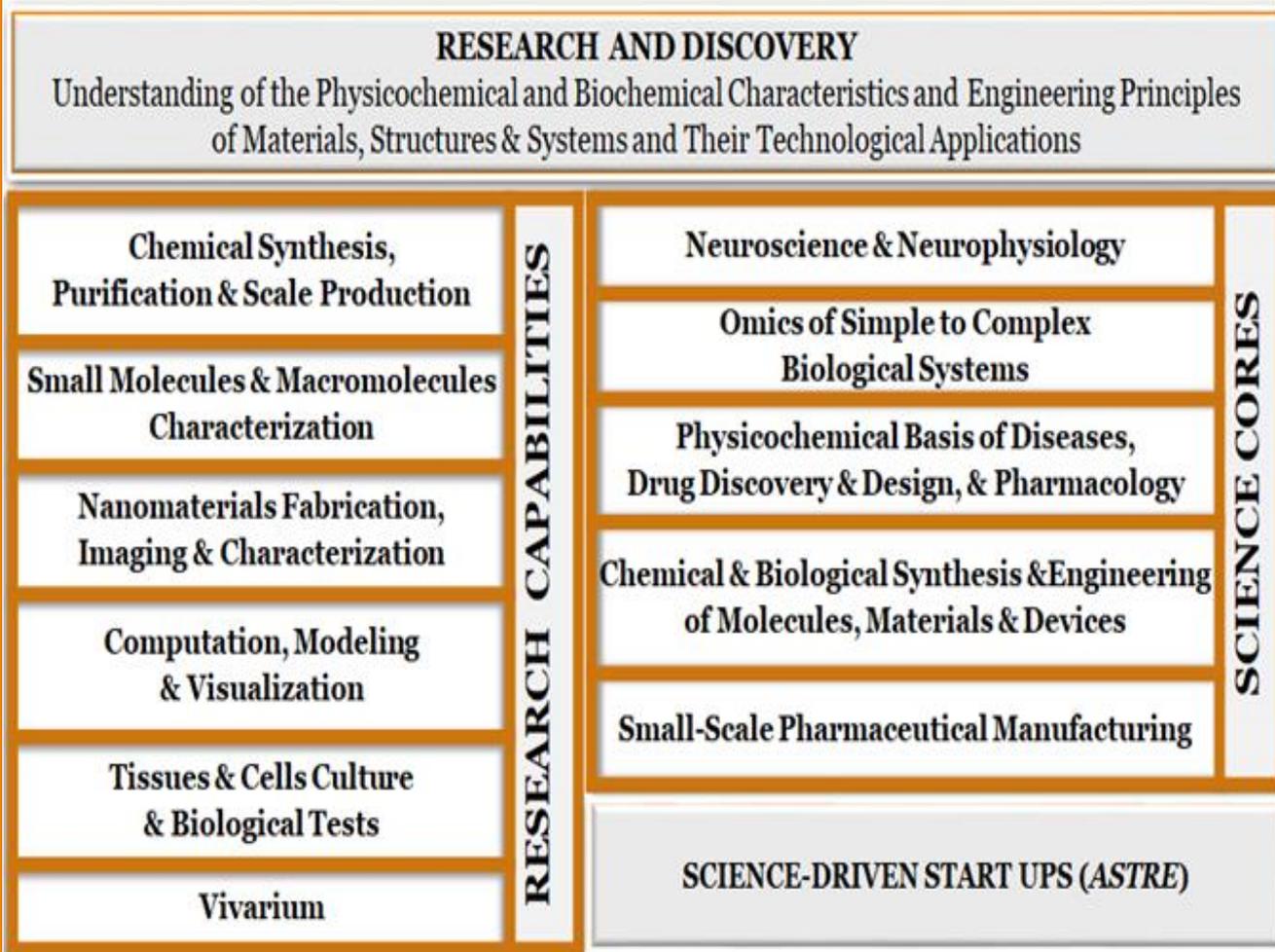
Vivarium

Scientific  
Instrumentation

Specialized  
Research Services

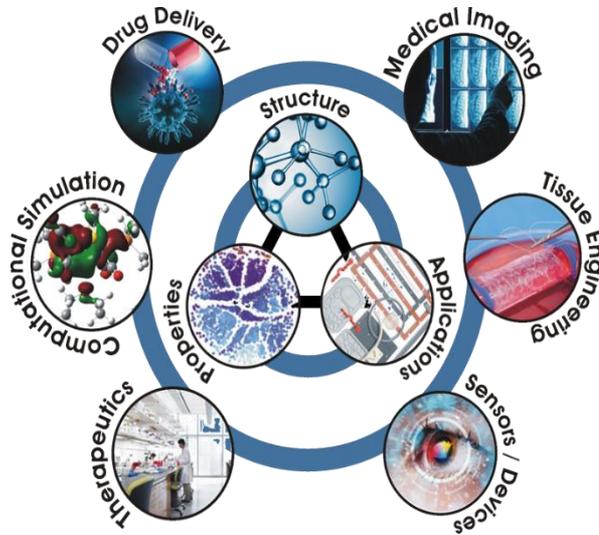


# Research



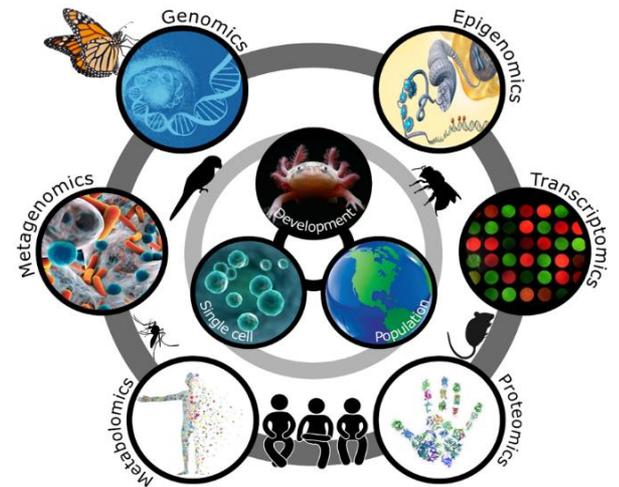
# Mission

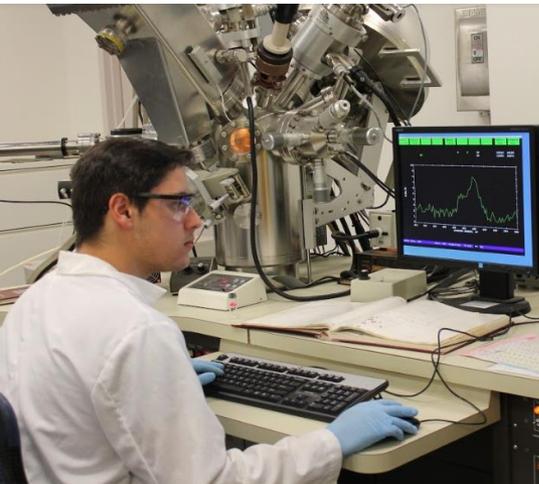
*To develop competitive scientific research with high social and economic value to position the UPR and Puerto Rico as a key player in molecular sciences research worldwide.*



**Biotechnology and Life Sciences**  
*In-depth insights of biological systems at different scales*

**Nanobiotechnology**  
*Nanomaterials Interaction in Complex Biological Environments*





- *Nuclear Magnetic Resonance*

- *Mass Spectrometry*

- *Atomic & Molecular Light Spectroscopy*

- *Neuroimaging & Electrophysiology Facility*

- *Functional Genomics and Sequencing*

- *Surface Spectroscopy and Microscopy*

Core Research  
Facilities



Diverse  
Scientific  
Community:

Collaborations  
&  
Partnerships



**Protein Structure Workshop**  
**March 16 and 17, 2019**



**Rigaku**



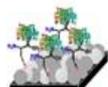
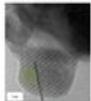
A National Science Foundation  
Science and Technology Center

## Nanotechnology and MicroChips

Carlos Cabrera Ph.D.



### Electrochemical Biosensors



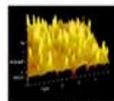
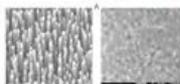
Enzyme-Palladium Nanoparticle Based Electrode



### MICROFABRICATION



Interdigital Au Electrode Microarray



Enzyme- Carbon Nanofiber Based Electrode

>40 Researchers  
>182 G & U Students

2013-2018

~200 Publications

\$33M Funding

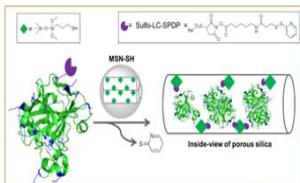
27 Patents

1 SBIR

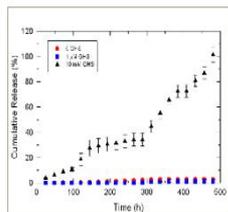
2 SBIR (In Progress)

## Modern Targeted Cancer Medicines

Kai Griebenow Ph.D.



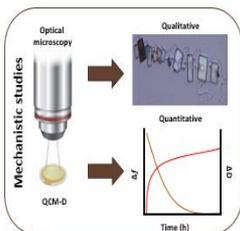
An apoptosis inducing protein is immobilized in silica nanospheres via a smart bond system. Homing ligands will be bound to this system next.



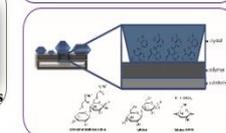
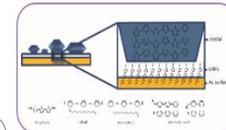
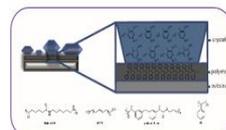
Nanoparticles accumulate in tumors by the enhanced permeation/retention effect which is based on the leaky blood vessels.

## Design, Applications, and Mechanistic Studies of Crystallizations on Polymers

Vilmali López-Mejías Ph.D.



Applications of polymer-crystal interfaces



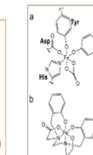
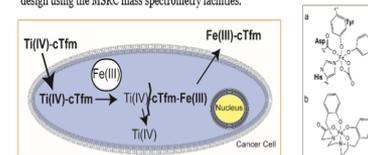
## Developing Ti(IV)-Based Anticancer Drugs using Chemical Transferrin Mimetics

Arthur Tinoco Ph.D.



Seek to revolutionize the design of Ti(IV)-based anticancer drugs:

- Using chemical transferrin mimetic (cTfm) ligands, which stably transport Ti(IV) into cells and release Ti(IV) to bind and deplete cells of Fe(III). This work will couple coordination chemistry and cell-based assays.
- Bioconjugating bioactive proteins and peptides to the cTfm moieties to facilitate passive and active targeting of cancer cells. MALDI/ToF experiments will provide for structure confirmation.
- Performing metallomics studies to determine the intracellular molecular targets of Ti(IV) to improve the drug design using the MSRC mass spectrometry facilities.



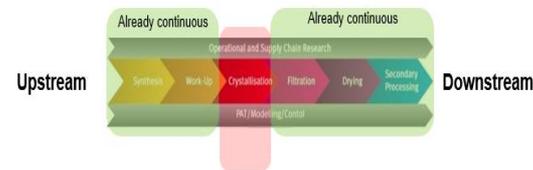
a. The transferrin metal binding site  
b. A cTfm representative.

## Small Scale Pharmaceuticals Manufacturing

Torsten Steltzer Ph.D.



- Small-scale, continuous, pharmaceutical manufacturing
- Crystallization from solution and melt of small & macro (protein) molecules
- Process intensification
- Case studies



# Education, Professional Training & Outreach

*A job alternative for scientists with expertise in tissues and cells culture, scientific instrumentation management, and compliance.*



STEM Professionals



BioScience Week

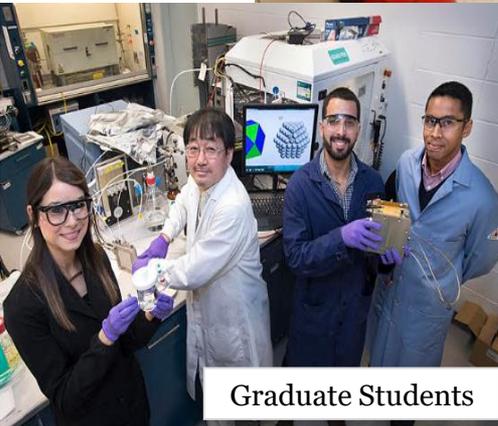
*A STEM experiential opportunity for High School students and the community.*



High School Students

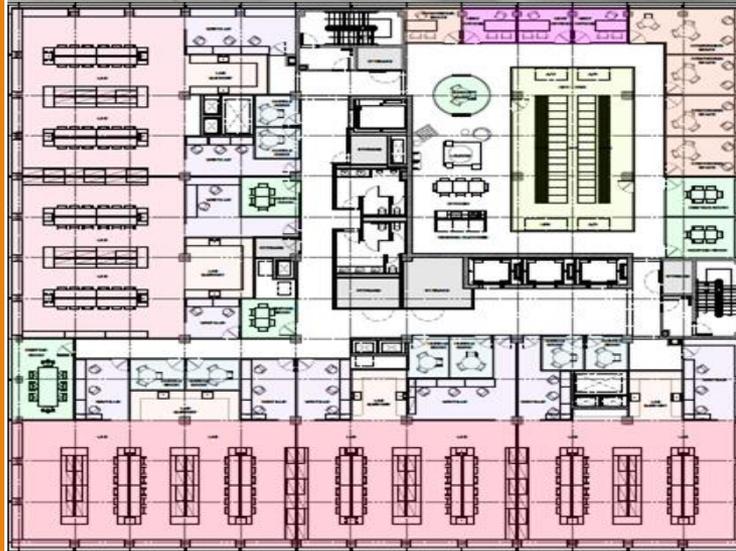


*A laboratory for the STEM education of students, postdoctoral, associate and affiliate researchers, technicians, and professional scientists.*



Graduate Students

# Co-Working Space





THANK YOU!

How to  
interact with  
the MSRC?

## MOUs for...

- COOP & Internship Experiences
- Career Opportunities
- Research Partnerships
- Academic Collaborations
- Business: space allocation, start-ups, scientific research services